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ABSTRACT

In this report, the mathematics and science proficiency of students in third, seventh, and eleventh grades in Catholic schools was compared to the national average of the 1985-86 National Assessment of Mathematics and Science. The introduction describes the differences in reading/writing and mathematics/science that the National Assessment of Educational Progress reports and the background characteristics of Catholic and public schools. Included in the second chapter are the proficienies related to: (1) demographic characteristics and family background; (2) school characteristics; (3) student behavior; (4) course work in computer, mathematics and science by eleventh-graders; and (5) social differences in course work. This paper concludes that Catholic school mathematics and science proficiency levels at grades three, seven, and eleven are above those of public school students. The differences between students in Catholic and public schools which relate to the association between family background and course-taking, and academic proficiency are summarized. Five levels of mathematics and science proficiency are appended. (YP)

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NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS PROFICIENCY IN MATHEMATICS AND SCIENCE: 1985-86

CATHOLIC AND PUBLIC SCHOOLS COMPARED

FINAL REPORT 1989

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NATIONAL ASSESSMENT OF EDUCATIONAL PROGRESS PROFICIENCY IN MATHEMATICS AND SCIENCE: 1985-86

CATHOLIC AND PUBLIC SCHOOLS COMPARED

FINAL REPORT 1989

Valerie E. Lee
Carolee Stewart

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INTRODUCTION

There has been considerable research in recent years documenting the academic advantages of attending Catholic schools (Bryk, Holland, Lee & Carriedo, 1984; Coleman, Hoffer & Kilgore, 1982; Coleman & Hoffer, 1987; Hoffer, Coleman & Greeley, 1985; Jencks, 1985; Lee & Bryk, 1988). Moreover, much of that research has described the equalizing effects of Catholic schooling -- the so-called "common school effect" (Coleman et al., 1982). That is, the overall advantages of a Catholic (compared to public) education are particularly marked for disadvantaged and minority students. Most of this research has used data from the nationally representative study, High School and Beyond, and has focused on secondary schooling.

Similar findings were reflected in research using data from the 1983-84 National Assessment of Educational Progress [NAEP] (Lee, 1985-86). In those reports the reading and writing proficiency of students in 4th, 8th, and 11th grades in Catholic schools was compared to the national average. While it was not possible to conduct the multivariate analyses which typified the research from High School and Beyond, and which adjusted for the social and academic differences of students entering Catholic and public schools, comparisons between Black and White students, or between those whose parents had relatively more or less education, showed that proficiency in writing, and especially in reading, was more similar for students with varied social backgrounds in Catholic schools than national average. That is, the "common school effect" was supported with National Assessment data.

It is our contention that both excellence and equity concerns are important in defining "good" schools. However, most of the research which has documented effective schooling has focused on high average achievement --

i.e., "good" schools are those where the average achievement of the students is high (see Purkey & Smith, 1983, for a review of this literature). Such schools are, unfortunately, much more likely to be found in affluent locations, most notably in suburban areas outside of large cities. It is difficult to untangle the "goodness" of such schools however, from the relative advantages of the students who attend them. Therefore, an expanded definition of school quality might include not only high average achievement but an equitable distribution of achievement across the varied social and academic background of the students in the school. It is the documented advantage of Catholic schools in both average achievement levels and a socially equitable distribution of achievement which characterized much of our other work in this area. It is also social equity concerns, coupled with general proficiency levels in mathematics and science, which comprise the focus of this report. While social equity was previously examined in terms of race/ethnicity and parental education, we have expanded the definition of social equity here to include gender. This is because there is a considerable amount of research which has documented the inferior performance of females in mathematics and science (Benbow & Stanley, 1980, 1983; Brush, 1980; Chipman & Thomas, 1985; Lee, 1988; Pallas & Alexander, 1983).

Differences in Reading/Writing and Math/Science NAEP Reports. We have attempted to pattern the present report on Catholic/public or Catholic/national average comparisons for the 1985-86 National Assessments of mathematics and science on the two previous reports which examined similar comparisons for reading and writing (Lee, 1985; 1986). Although there are

many similarities in our approach here to the previous ones there are also some changes. Although this report is complete unto itself, the results presented here should be seen in light of those previously reported. Readers familiar with the previous reports probably will find this report more meaningful. Let us explain the differences in the reports.

NAEP assessments were administered to students in grades 4, 8, and 11 in 1983-84, while the 1985-86 mathematics and science assessments were of 3rd, 7th, and 11th grade students. The NAEP mathematics and science Report Cards (Dossey, Mullis, Lindquist & Chambers, 1988; Mullis & Jenkins, 1988) group students by age as well as grade level. Another important change is in the size of the NAEP samples, with the total sample size of the 1985-86 assessment less than half the size of the 1983-84 assessment. Instead of evaluating the mathematics and science proficiency levels of approximately 2,000 Catholic school students, this investigation examines mathematics and science proficiency scores of between 600 and 700 students from these schools. Although the samples are drawn randomly, measurement error somewhat reduces the statistical reliability of results, particularly for the smaller Catholic school subgroups.

On the other hand, the ability to make comparisons has improved considerably. While not possible in the previous reports, changes in NAEP's method of reporting results allows us to make many comparisons between Catholic and public schools on subgroups, where previous comparisons were with the national average (including Catholic school students) and were thus nonindependent comparisons. Because we are able to compare Catholic and public schools in a substantial portion of this document direct comparisons with similar information in the previous two reports are not

comparable in most cases. It should be pointed out however, that on the average, public school figures are only slightly different from the national average in all areas. Nevertheless, the increased statistical validity of comparing two nonoverlapping samples is a definite benefit.

We have chosen to incorporate both mathematics and science reporting into one document because of the inherent interrelationship between these two curriculum areas. The mathematics and science results will be integrated throughout this document, whereas the reading and writing reports were separate documents. Our discussions first consider mathematics scores, followed by results in science.

Background Characteristics of Catholic and Public Schools. Table 1 displays some descriptive differences in the backgrounds of students in Catholic and public schools.[1] Between 6% and 7% of the nation's students attend Catholic schools according to these data. Except at grade 11 in Catholic schools (where males outnumber females by about 11%) both genders are equally represented in Catholic and public schools. The proportion of Black students in Catholic schools increases by grade (about 5% of 3rd-graders, 8% at the 7th grade level, and 11% of 11th-graders).[2] At all three grade levels the proportion of Black students is higher in public schools (about 15%) and that proportion is steady across the grades. The proportions of Hispanics is approximately equal in public and Catholic schools (about 10% at the 3rd and 7th grades), but drops at the 11th grade. There are more Hispanics than Blacks in Catholic schools, but those proportions are reversed in public schools.[3]

On the average, Catholic school parents have more education than do their public school counterparts. For example, at grade 11, 6% of Catholic school parents have less than a high school diploma, as compared to 9% of public school parents. Catholic school students at all three grade levels have a greater proportion of parents with an education beyond high school graduation than do students in public schools.[4]

The distribution of Catholic schools throughout the country is also quite different from that of public schools. While there are relatively fewer Catholic schools in the west and southeast, public schools are reasonably well distributed across the four regions. Catholic schools are also distributed differently from public schools in terms of their residential locations. Whereas most Catholic schools are located in cities (advantaged urban and medium city areas), the greatest proportions of public schools are located in small places.[5]

Table 1

Background Characteristics of Students in

Catholic Schools as Compared to Public Schools[a]

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
% Attending[b]	6.2%	89.8%	6.8%	89.3%	6.1%	90.5%
Sample Size	634	9975	622	11247	701	19866
DEMOGRAPHIC CHARACTERISTICS:						
% Female	50.1%	49.7%	49.9%	49.2%	44.4%	49.8%
% Black	4.5%	14.9%	8.7%	15.7%	10.5%	13.6%
% Hispanic	9.6%	10.4%	12.5%	10.4%	5.3%	7.7%
PARENTS' EDUCATION:[c]						
% < HS Grad	2.2%	8.0%	2.1%	9.9%	6.2%	9.1%
% HS Grad	18.4%	24.6%	26.5%	33.6%	22.9%	29.3%
% > HS Grad	12.1%	10.2%	17.9%	16.9%	21.6%	23.1%
% Col Grad	67.3%	57.2%	53.5%	39.7%	49.3%	38.4%
REPRESENTATION BY REGION:						
% Northeast	18.1%	20.9%	44.4%	19.1%	47.8%	22.5%
% Southeast	12.1%	22.8%	0.9%	24.2%	2.4%	21.8%
% Central	59.3%	25.9%	31.2%	27.0%	33.9%	28.0%
% West	10.5%	30.4%	23.5%	29.7%	15.9%	27.6%
RESIDENTIAL LOCATION:[d]						
% Adv Urban	28.0%	10.1%	26.9%	8.1%	22.7%	12.1%
% Big City	15.4%	8.3%	24.9%	11.3%	15.9%	7.6%
% Fringe	10.2%	12.1%	12.3%	12.5%	32.8%	14.8%
% Med City	25.4%	16.5%	23.0%	14.5%	21.7%	15.1%
% Small Place	19.2%	33.7%	10.7%	37.7%	6.5%	39.7%

[a]Throughout this report, proportions have been calculated from sample sizes given in the NAEP 1985-86 Mathematics Proficiencies Assessment Almanacs, grades 3, 7, and 11, except where noted.

[b]Other private schools have been excluded from this report.

[c]Proportions of all students who knew the level of their parents' education are given. At grade 3 slightly less then half of the students did not know the level of parents' education; and approximately one-tenth of 7th-graders and 3% of 11th-graders did not know this information in both sectors.

[d]Proportions of students who attend schools in extremely rural and

COMPARISON OF MATHEMATICS AND SCIENCE PROFICIENCY SCORES

In Table 2, which shows mathematics and science proficiency averages for students in Catholic and public schools, it is evident that Catholic school students score consistently and significantly[6] higher than students in public schools at all three grade levels in both science and mathematics. This "Catholic school proficiency advantage" in mathematics and science is also evident in Figure 1. These figures are consistent with other research comparing achievement in Catholic and public schools, and are similar to those shown for the 1983-84 NAEP reading and writing assessments (Coleman et al., 1982; Hoffer et al., 1985; Lee 1985-86).

TABLE 2

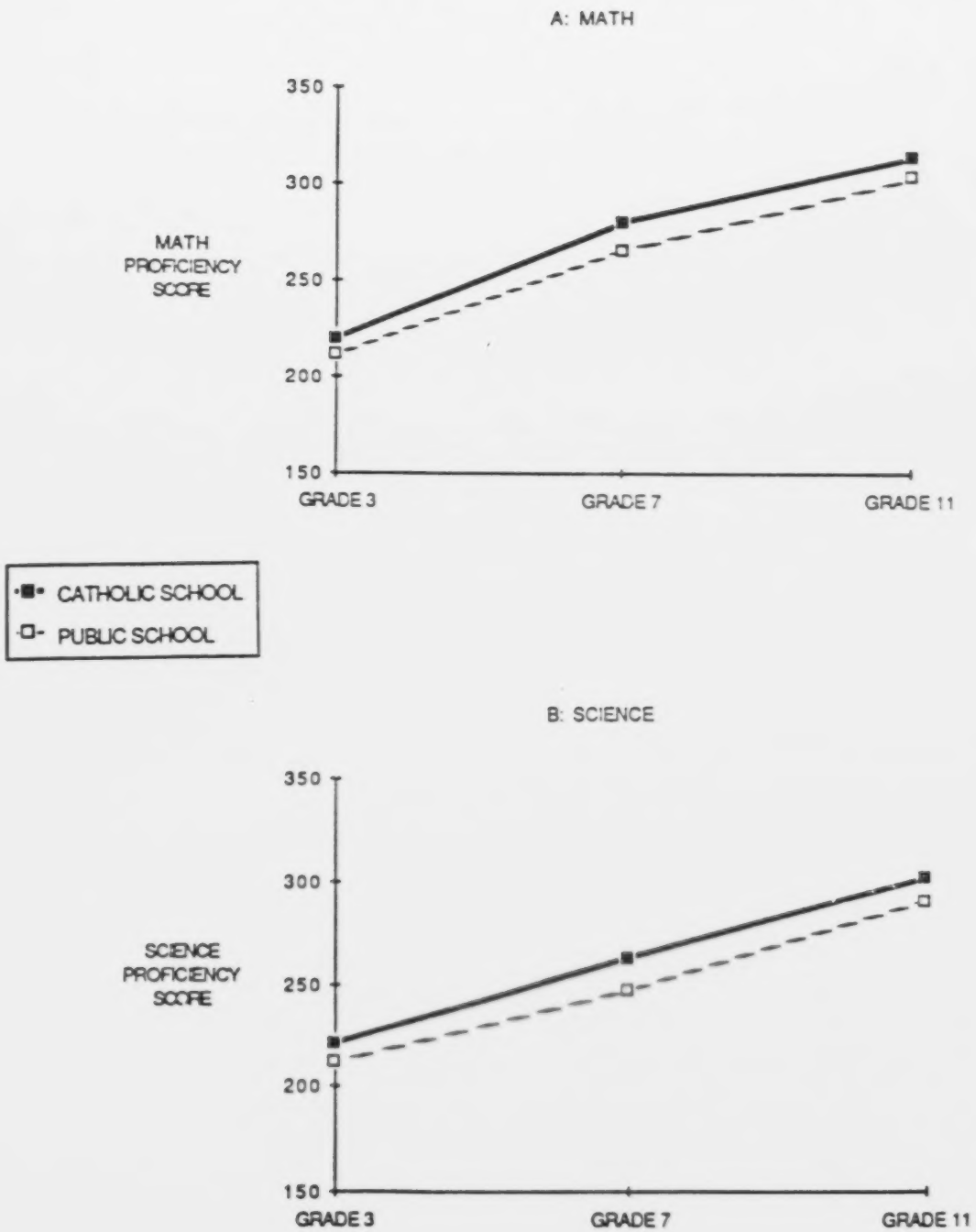
1985-86 Mathematics and Science Proficiency Scores for Students in Catholic and Public Schools

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
MATH	220.1	211.6	280.1	265.6	313.6	302.7
SCIENCE	221.0	211.7	262.5	246.8	300.5	289.6

Mathematics and Science Proficiency Related to Demographic Characteristics and Family Background.

A considerable amount of recent research has been devoted to equity issues in the two sectors, with the general finding that Catholic schools more closely resemble the "common school," where all children learn regardless of their social or demographic background (Coleman et al., 1982; Jencks, 1985; Lee & Bryk, 1988). While the analyses described here do not allow the statistical adjustments necessary to investigate such issues in

FIGURE 1
1985-86 MATHEMATICS AND SCIENCE PROFICIENCY SCORES
FOR STUDENTS IN CATHOLIC AND PUBLIC SCHOOLS



causal analyses, we have chosen to examine issues of equity in a simpler fashion. That is, male/female, White/Black, and White/Hispanic proficiency differences are computed as well as differences in proficiency for differing levels of parental education. Recognizing the absolute achievement levels shown in the previous section to be higher in Catholic schools (but being unable to ascribe this uniquely to the schools themselves because of the selection differences of the students) we have chosen to investigate the equity in the social distribution of that achievement. Such equity we describe as existing in schools where achievement differences between these demographic groups are small or nonexistent.

Gender Equity. The mathematics and science proficiency levels of students in Catholic and public schools -- separated by gender and by race/ethnicity -- are presented in Table 3. Here the scores of Catholic school students are still significantly higher than their public school counterparts, with few exceptions. That is, while Black and Hispanic mathematics differences and White/Black science differences at grade 3, and White/Hispanic science differences at grade 11 are not statistically different between the two school types, all trends favor Catholic schools. The lack of statistical significance in these comparisons is due, in large part, to the relatively small sample size for some Catholic school subgroups. Differences between genders are very much lower than differences between racial/ethnic groups in both mathematics and science, and in both Catholic and public schools.

In Figure 2 (created from figures in Table 3) three trends are evident. First, in almost all cases (except 7th grade math), males outscore females

in mathematics and science. Second, while gender differences are quite small in elementary schools, the "male advantage" increases as students progress in school. The third trend is that these differences are generally larger in Catholic than in public schools. Gender differences in 7th and 11th grades are statistically significant, while those in grade 3 are not. It has been shown elsewhere (Lee, 1988) that gender differences favoring males in high school mathematics achievement are greatest for higher-ability students. Since the general proficiency level of mathematics and science proficiency is higher in Catholic schools, this phenomenon may explain the sectoral differences which relate to gender. Without access to multivariate statistical techniques, such factors may not be untangled.

10

Table 3

Proficiency Scores for Students

in Catholic Schools as Compared to Public Schools

by Gender and Race/Ethnicity Groupings

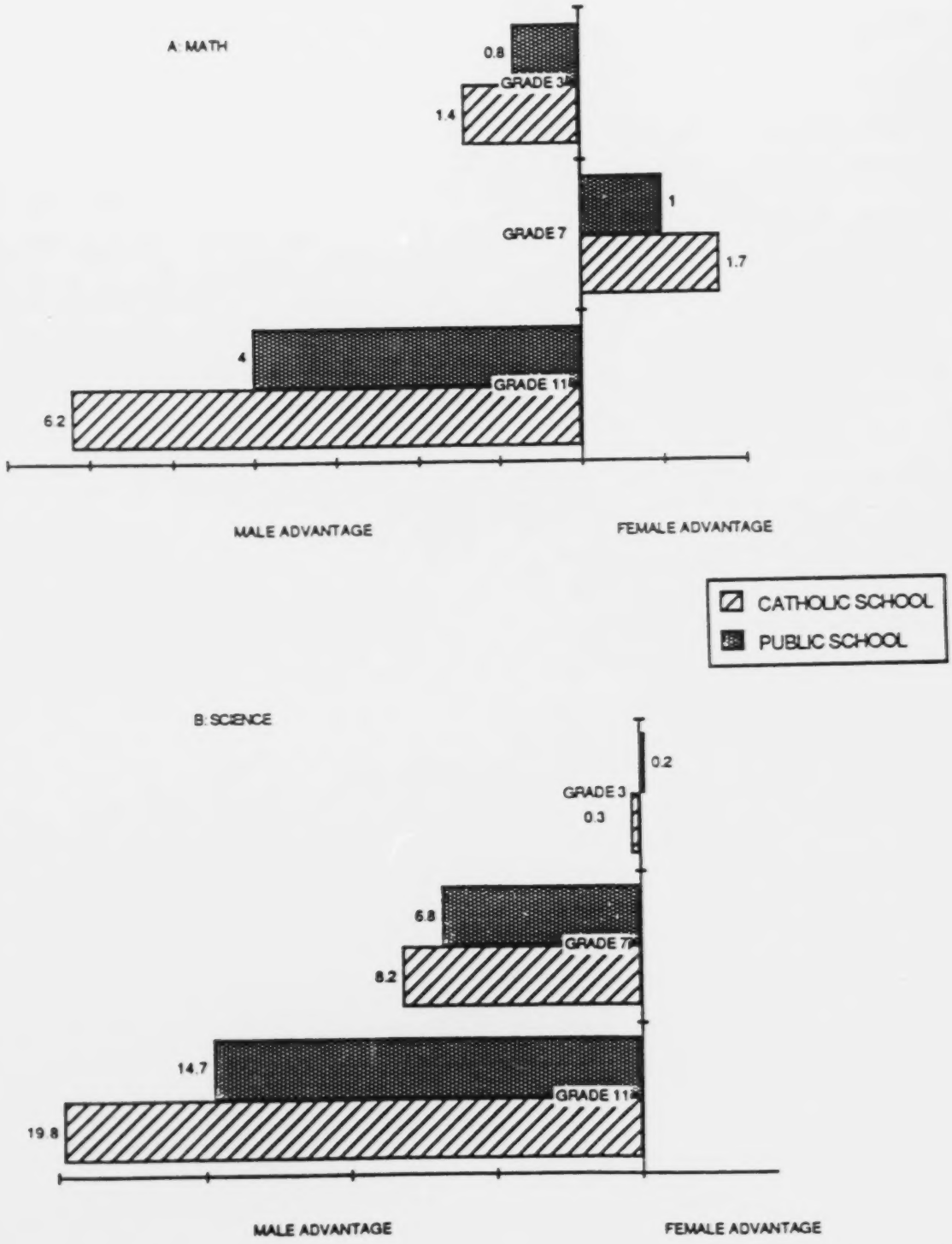
MATH

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Males	220.8	212.0	279.3	265.1	316.4	304.7
Females	219.4	211.2	281.0	266.1	310.2	300.7
Whites	223.9	219.2	284.5	272.6	316.1	308.4
Blacks	188.2	187.3	254.8	244.6	294.4	278.1
Hispanics	199.8	194.9	267.6	249.7	306.6	284.6

SCIENCE

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Males	221.1	211.6	266.4	250.2	309.4	297.1
Females	220.8	211.8	258.2	243.4	289.6	282.4
Whites	226.6	222.0	269.2	257.9	303.8	299.3
Blacks	180.8	179.2	230.9	215.7	273.3	251.8
Hispanics	196.1	189.0	237.9	220.3	279.9	262.6

FIGURE 2
MATHEMATICS AND SCIENCE PROFICIENCY ADVANTAGE
FOR MALES AND FEMALES IN CATHOLIC AND PUBLIC SCHOOLS



Racial/Ethnic Equity. Minority students in Catholic schools score consistently and significantly above their minority counterparts in public schools at all grade levels in both mathematics and science (Table 3). Moreover, White/Black and White/Hispanic proficiency differences are significant at all grade levels and in both types of schools for mathematics and science. While science proficiency score differences between White and minority students show somewhat similar trends from those for mathematics for the same subgroups, race/ethnic differences in science proficiency scores for both types of schools are strikingly greater than for mathematics. That is, minority students in both school types and all three grade levels score particularly lower in science, in comparison to Whites. This is seen, of course, in the light of the generally poor showing of American students in science (Mullis & Jenkins, 1988).

The racial/ethnic between-sector mathematics proficiency comparisons indicate an inconsistent pattern (see Figure 3A). The score differences in mathematics proficiency between Whites and Blacks (what we call the "White mathematics proficiency advantage") is diminished in Catholic schools as the grade level increases, so that by grade 11 this difference is 14 points less than at grade 3. When compared with public school differences, we see that the White mathematics proficiency advantage (compared to Blacks) is less in public schools than in Catholic schools for 3rd grade, quite similar at 7th grade, and considerably higher (i.e., less equitable) in public school at 11th grade. The White mathematics proficiency advantage over Hispanics is less than that for Blacks in both sectors (Figure 3B). While constant across grade levels in public school, it shows a sharp decline from 3rd to 11th grade for Catholic schools.

FIGURE 3
MATHEMATICS PROFICIENCY ADVANTAGE
OF WHITE STUDENTS AS COMPARED WITH BLACK AND HISPANIC STUDENTS
IN CATHOLIC AND PUBLIC SCHOOLS

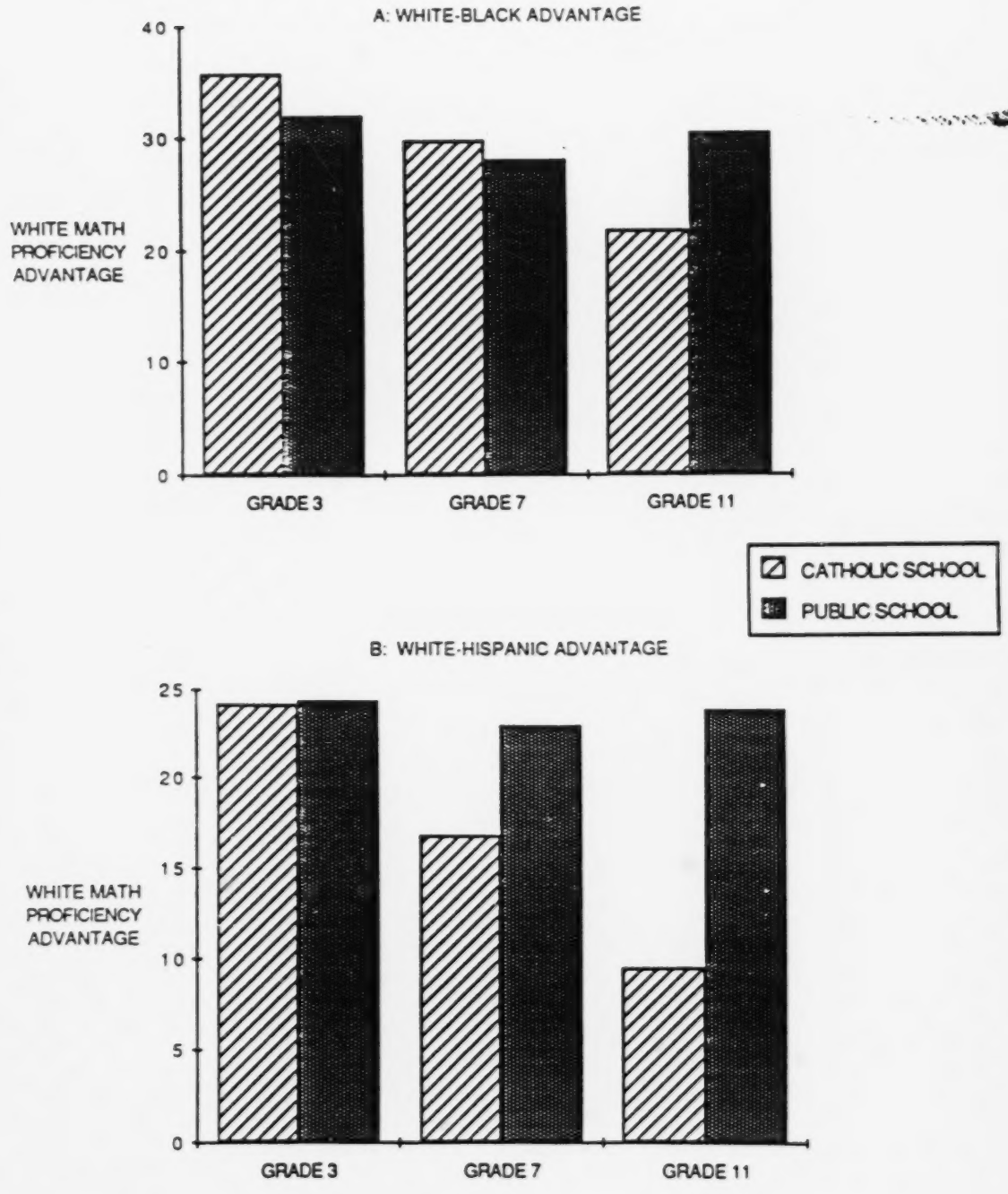
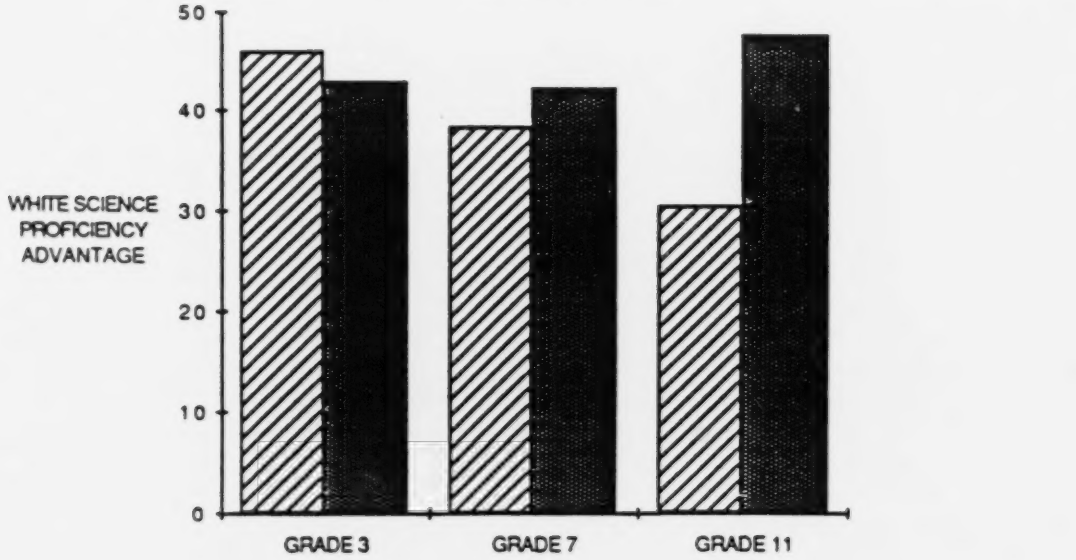
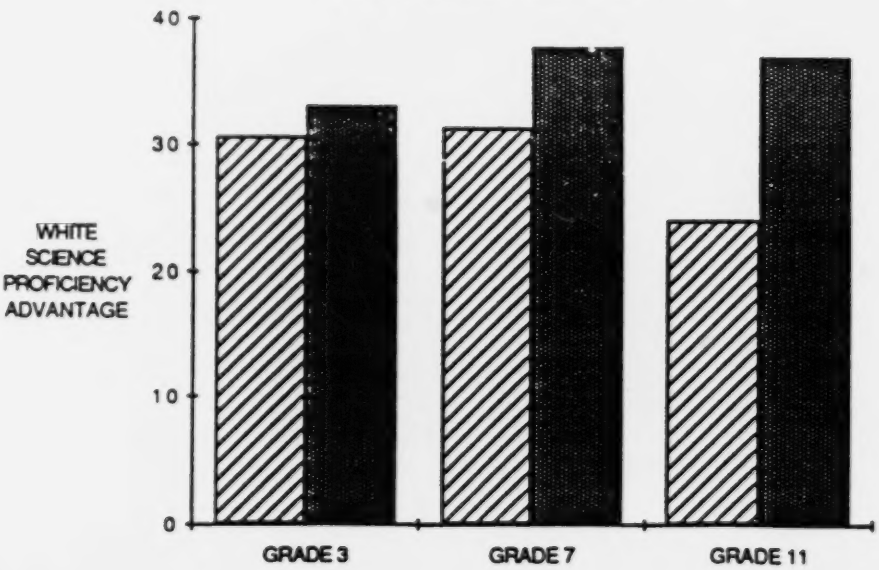


FIGURE 3 (CONTINUED)
SCIENCE PROFICIENCY ADVANTAGE
OF WHITE STUDENTS AS COMPARED WITH BLACK AND HISPANIC STUDENTS
IN CATHOLIC AND PUBLIC SCHOOLS

C: WHITE-BLACK ADVANTAGE



D: WHITE-HISPANIC ADVANTAGE



In terms of minority equity in science proficiency, we again see that White/Black Catholic school score differences are diminished as the grade level increases (Figure 3C). Public school White/Black differences remain similar between 3rd and 7th grade, and then increase at grade 11. By grade level, Catholic differences are greater at 3rd grade, but greater in public schools at 7th and 11th grades. As with mathematics, science proficiency White/Hispanic differences are less than White/Black differences. By grade, the differences increase consistently in public schools from grade 3 to 11 and decrease across grades in Catholic school science proficiency White/Hispanic differences (Figure 3D).

A pattern of increasing equity in both mathematics and science proficiency over grade levels in Catholic schools for both minority groups thus emerges, beginning with larger initial minority group deficits in grade 3, but reduced to smaller deficits by grade 11. This contrasts with a rather steady White advantage in public schools. Later in this report we present a possible explanation for these cross-sector racial equity differences in mathematics proficiency.

Equity by Parental Education. Besides equity of educational outcomes in terms of gender and race/ethnicity, a common consideration in educational sociology is the family background of students. This is commonly explored with a measure of socio-economic status (SES) which includes family income, parental education levels, and parents' occupation. NAEP measured only parental education levels, which we use as a proxy for social class. The proficiency scores of students in each of these groups is displayed in Table 4 (recall the proportion of students from each type of school at each

grade level whose parents had attained each of four educational levels from Table 1). Similar to racial/ethnic differences (i.e., minority students in Catholic schools were particularly advantaged compared to their public school minority counterparts) in general, the achievement advantage of Catholic over public school students is greatest for children of parents with the least education. This pattern extends across all three grade levels and is consistent for both mathematics and science.

Working Mothers. Most mothers of school children in this 1985-86 NAEP sample are working, regardless of school sector or grade level. These proportions are displayed in Table 5. While slightly fewer mothers of younger children work, and mothers of Catholic school children are very slightly less likely to work, differences are not great. Moreover, proficiency differences for children of working and nonworking mothers are slight and do not consistently favor either group (therefore, we have not reported them). The complicated issue of the effect of maternal work outside the home on student progress requires a sophisticated multivariate analysis beyond the scope of the present report. What is striking (although reported elsewhere) is the large proportions of working mothers for all school-age children (over two-thirds of all mothers in both sectors). It is clear that mothers of students who attend Catholic school are slightly more likely to stay home in 3rd and 7th grades, but slightly more likely to be working outside the home for 11th-graders. This may be due to the higher tuition levels in Catholic secondary schools.

Table 4

Proficiency Scores for Students

in Catholic Schools as Compared to Public Schools

by Parents' Education

MATH

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
<HS Grad	209.6	194.8	266.7	249.2	301.7	283.8
HS Grad	210.3	205.4	274.9	259.5	302.5	293.3
>HS Grad	225.5	217.6	285.6	274.2	314.9	306.2
Col Grad	227.3	221.0	284.3	277.1	320.6	314.7

SCIENCE

	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
<HS Grad	207.7	190.2	229.2	224.3	282.5	263.3
HS Grad	209.8	204.4	254.8	239.7	285.6	276.9
>HS Grad	230.4	219.8	267.5	257.8	301.9	294.9
Col Grad	229.5	224.5	270.5	261.3	309.4	306.6

Table 5

Proportions of Students

in Catholic Schools as Compared to Public Schools

by Mothers' Work Status

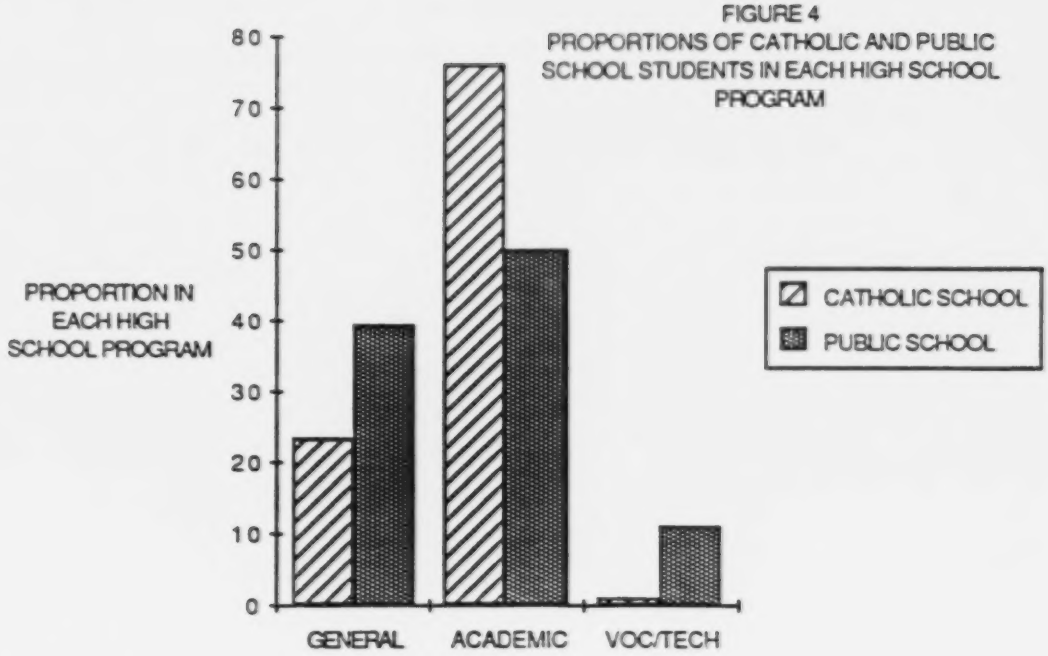
	GRADE 3		GRADE 7		GRADE 11	
Does Your Mother Work?	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Yes	63.3%	65.0%				
Full-time			43.8%	47.9%	47.3%	54.3%
Part-time			20.4%	22.5%	28.1%	17.4%
No	35.2%	32.7%	34.2%	27.2%	22.9%	25.1%

Mathematics and Science Proficiency Related to School Characteristics

School Program. There is a considerable and growing amount of research which relates the characteristics of schools and school programs to student achievement, especially the effective schools research (Purkey & Smith, 1983). Moreover, the question of school organizational differences, particularly in terms of academic program, have been recently examined in regard to Catholic and public high schools (Lee & Bryk, 1988; Lee & Bryk, 1989; Bryk & Thum, 1988; Hoffer et al., 1985). These studies have focused on the academic organization of the school, concluding that the academic excellence and educational equity of Catholic high schools is due, in considerable part, to the academic nature of the school program followed by all students, regardless of family or academic background. Although the analyses in this section (as well as the entire report) are descriptive, the data on high school programs included here relates directly to the research studies cited above.

The proportions of 11th grade students in the three curricular tracks -- general, academic (college preparatory), and vocational/technical -- in Catholic and public schools are shown in Figure 4. Over three-quarters of all Catholic high school students, compared to about half of public school students, are in the academic track. About twice as many public as Catholic school students are in the general track. About 10% of public school students, but very few Catholic school students, follow a vocational program in high school. Because Catholic school students in the vocational/technical program make up less than one percent of the total Catholic school population, we have eliminated these comparisons. These proportions are similar to those reported from High School and Beyond data (Lee & Bryk, 1988).

FIGURE 4
PROPORTIONS OF CATHOLIC AND PUBLIC SCHOOL STUDENTS IN EACH HIGH SCHOOL PROGRAM



It has been speculated that Catholic school students exhibit higher academic achievement primarily because more of them are in the academic track. To eliminate this possible confounding factor, we compare the proficiency scores of Catholic and public school 11th-graders within tracks (Table 6). The 23% of Catholic school students in the general curricular program score higher in both mathematics and science than the 39% of those in public schools in the general program (significantly so in mathematics). Proportions of students in the academic/college preparatory program for Catholic and public schools are 76% and 50%, respectively, and mathematics and science proficiency scores for these two groups are quite similar.

This finding reflects the earlier cross-sector findings, especially that of Lee & Bryk (1988). That is, the proficiency differences between those in the academic and general curricular tracks in the two sectors follow a distinct pattern in both mathematics and science. Catholic school students' proficiency scores are less related to students' curriculum track than their public school counterparts. That is, curriculum track placement is less differentiating in Catholic schools. Cross-sector score differences between students in the general and academic tracks are more marked in mathematics than in science (16 vs. 30 point differentials in Catholic and public schools). This may be due to nonacademic curriculum track placement restricting public school students' access to advanced courses in mathematics (e.g., algebra II, trigonometry, calculus) and instead, they enroll in nonacademic mathematics courses (e.g., consumer mathematics). On the other hand, academic courses are usually the only mathematics courses available to Catholic school students, regardless of their track placement. We explore

this question later in this report when we investigate course selection patterns.

Region. Table 7 displays the mathematics and science proficiency of students in each type of school by region (we eliminated the southeast region from these comparisons due to the very small number of Catholic school students in that region -- see Table 1). For 3rd-graders, the mathematics and science proficiencies of Catholic school students in the central region is higher than public school students, while reasonably similar in the northeast and west. By 7th grade, Catholic school students have significantly higher mathematics proficiencies than those in public schools in all regions, especially those in the northeast. This pattern continues for 11th-graders in the two types of schools. These patterns are quite similar for science proficiency, except that the score differences -- while higher in Catholic schools -- are not significant.

Residential Location. Trends in mathematics proficiency by residential location are displayed in Figure 5A. For both types of schools and at all grade levels, students in big cities score consistently lower than all others. With the exception of Catholic school 3rd-graders, students in advantaged urban areas average higher mathematics proficiencies than students in all other residential locations. Recall that the proportion of Catholic schools located in both big cities and advantaged urban areas is considerably higher than public schools. In general, Catholic school students score higher in mathematics than public school students at each location. Science proficiency scores by residential location (Figure 5B) show trends which

Table 6

Proportions and Proficiency Scores for Students

in Catholic Schools as Compared to Public Schools

by High School Program[a]

MATH

HS PROGRAM	CATHOLIC SCHOOL MATH SCORE	CATHOLIC SCHOOL % IN PROGRAM	PUBLIC SCHOOL MAATH SCORE	PUBLIC SCHOOL % IN PROGRAM
General	301.5	23.3%	288.8	39.3%
Academic/Col Prep	317.8	75.9%	318.4	49.9%
Difference	16.3		29.6	

SCIENCE

HS PROGRAM	CATHOLIC SCHOOL SCIENCE SCORE	PUBLIC SCHOOL SCIENCE SCORE
General	280.6	272.5
Academic/Col Prep	307.4	309.1
Difference	26.8	36.6

[a]Students in the vocational/technical program have been excluded because of their small representation in Catholic schools.

Table 7

Proficiency Scores for Students

in Catholic Schools as Compared to Public Schools

by Region of the Country

MATH

	GRADE 3		GRADE 7		GRADE 11	
REGION	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Northeast	210.9	214.1	283.5	273.5	313.9	307.5
Central	225.3	215.1	279.5	269.7	313.0	305.1
West	212.0	209.5	275.8	261.7	315.7	301.3

SCIENCE

	GRADE 3		GRADE 7		GRADE 11	
REGION	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Northeast	213.6	215.4	263.7	253.2	300.5	295.2
Central	227.1	215.9	265.2	253.8	299.8	293.1
West	204.7	208.9	257.1	241.1	302.8	288.1

are similar to those in mathematics, although the patterns for Catholic schools are less consistent. An anomalous result is the lower average scores of Catholic schools in small places. Because of the very small sample size for this group, we place no substantive interpretation on this result.

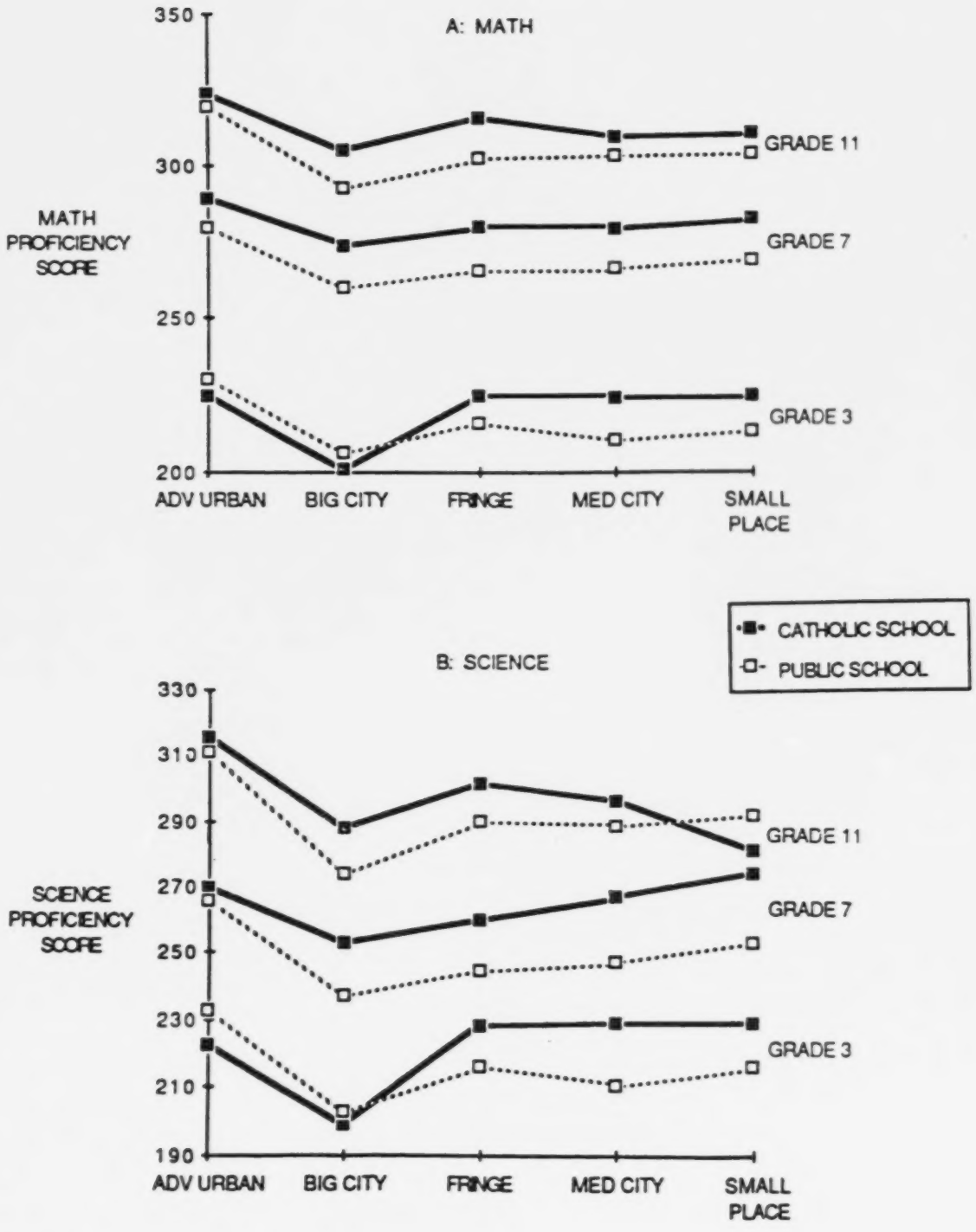
Mathematics and Science Proficiency Related to Student Behaviors

Prior research has shown that student behaviors related to academics strongly affect their achievement. This is true in Catholic as well as public schools (Bryk et al., 1984; Lee & Bryk, 1988). In this section, we investigate bivariate relationships between various academic behaviors (homework, television viewing, home computer presence) and proficiency in mathematics and science for 7th and 11th graders in Catholic and public schools. As before, no causal inferences about either these relationships or the differences in Catholic and public schools may be drawn because statistical adjustment for selection differences was impossible.

The amount of time a student spends on homework, the amount of time watching television, and whether or not there is a computer in the home are all related to mathematics and science proficiency. On average, Catholic school students exhibit more positive academically related behaviors: they spend more time on homework, less time watching television, and are more likely to have a computer at home than students who go to public schools.

Homework. Homework patterns and their relationship to mathematics and science proficiency can be seen in Figure 6. It is noteworthy that over a third (35%) of public school but less than a fifth (18%) of Catholic school 11th-graders report doing less than one hour of homework per day. For 11th

FIGURE 5
MATHEMATICS AND SCIENCE PROFICIENCY SCORES
RELATED TO RESIDENTIAL LOCATION
FOR STUDENTS IN CATHOLIC AND PUBLIC SCHOOLS



graders, the relationship between the amount of time spent on homework and mathematics and science proficiency is positive for both types of schools. The pattern of the relationship between homework and proficiency scores for 7th-graders is interesting. It appears that, for both sectors, there is an optimal amount of time students should spend on homework -- optimal, that is, in terms of its relationship to proficiency on tests. Those who spend two or more hours per day on homework may be doing so because they are having trouble with their work. This trend is almost identical for both sectors for mathematics and science.

Television. The amount of time students spend in front of a television set has a generally negative relationship with mathematics and science proficiency, as can be seen in Figure 7. A striking finding is that more than half of all 3rd and 7th grade students in both types of schools watch television for four hours or more each day (proportions not shown). A third of all public school 3rd-graders and 29% of all Catholic school 3rd-graders watch six or more hours of television per day, which has a strongly adverse affect on test scores.

While the relationship between the amount of time spent watching television and test performance is negative and linear for 11th-graders in both mathematics and science, this is not the case for the other grades. That is, it is only excessive amounts of television viewing which appear to negatively affect 7th-graders. For 3rd-graders, test performance slightly increases for moderate television viewing (up to 4 hours a day), and drops for those who watch excessive amounts. Catholic/public differences are generally similar for the relationship between television viewing and mathematics

FIGURE 6
MATHEMATICS AND SCIENCE PROFICIENCY SCORES
RELATED TO DAILY HOMEWORK
FOR STUDENTS IN CATHOLIC AND PUBLIC SCHOOLS

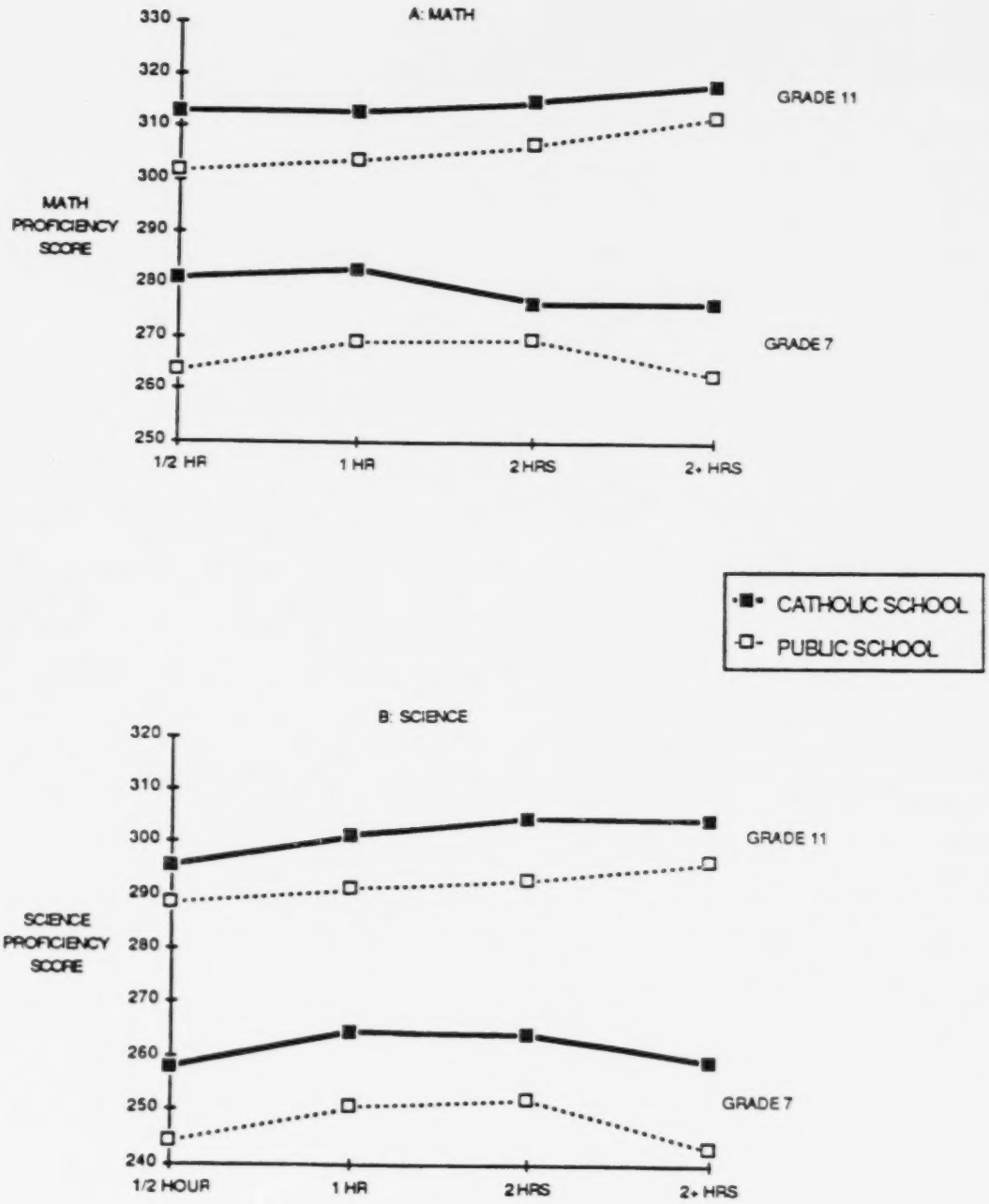
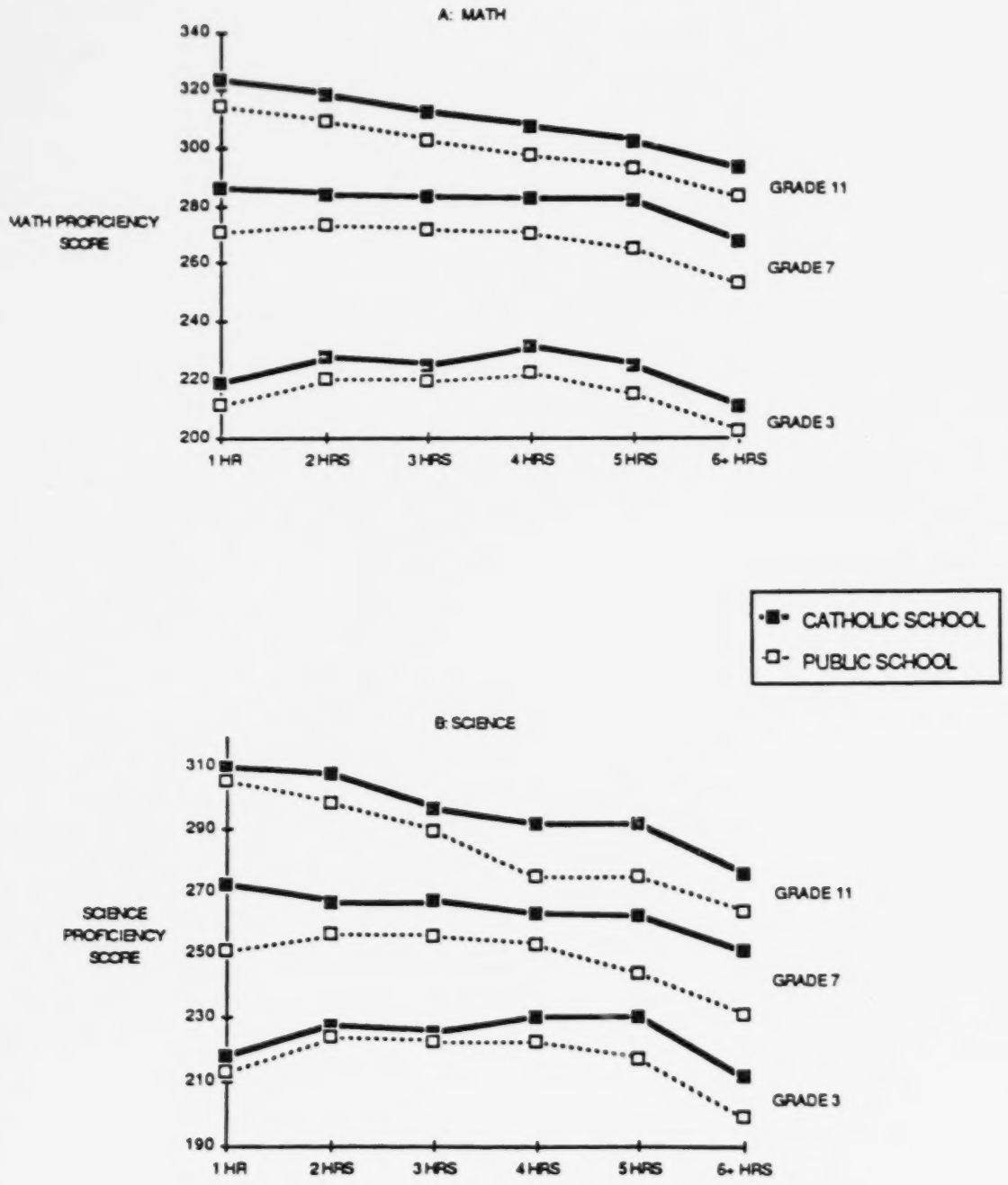


FIGURE 7
MATHEMATICS AND SCIENCE PROFICIENCY SCORES
RELATED TO DAILY TELEVISION VIEWING
FOR STUDENTS IN CATHOLIC AND PUBLIC SCHOOLS



proficiency. However, excessive television viewing seems to be particularly damaging for public school students (i.e., the Catholic school score proficiency). However, excessive television viewing seems to be particularly damaging for public school students (i.e., the Catholic school score advantages in science are largest in these areas). As we have mentioned previously, television watching is likely to be related to demographic differences in the students who attend Catholic and public schools.

Home Computers. There are three issues to be considered here. First, what is the difference in the proportion of students in the two school sectors who have computers in the home? Second, how does computer ownership affect proficiency in mathematics and science? Third, what proportion of students in both sectors report taking computer courses in their schools? Figure 8 provides information about the first question: more than a quarter of the homes of children in both sectors and all three grade levels were reported to have computers in 1985-86. More Catholic school homes have computers (especially those of 7th-graders). This is not surprising since we know such children are somewhat more advantaged.

To address the second question, mathematics and science proficiency scores appear to be related to having a computer in the home at all three grade levels and in both types of schools (Table 8). However, this is likely to be a spurious relationship, as both academic proficiency and computer ownership are related to family advantage. At all three grade levels, and in both types of schools, students who have computers at home appear to benefit more in the areas of mathematics and especially science, as the proficiency score differences between those with and without

computers at home are greater in science than in mathematics. These differences are consistently less for students in Catholic schools for both mathematics and science (see Table 8).

Table 8

Proficiency Scores for Students

in Catholic Schools as Compared to Public Schools

by Whether or Not There is a Computer in the Home

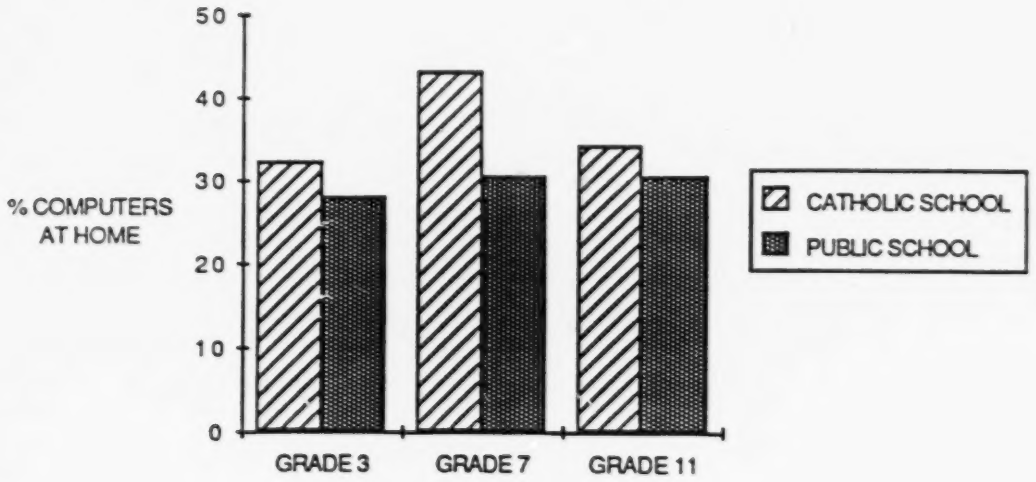
MATH

Do You Have A Computer At Home?	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Yes	222.2	216.6	285.8	274.2	319.1	312.5
No	220.0	210.0	276.6	262.7	310.9	298.7

SCIENCE

Do You Have A Computer At Home?	GRADE 3		GRADE 7		GRADE 11	
	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL	CATH SCHL	PUB SCHL
Yes	224.9	217.6	269.9	258.9	310.0	304.2
No	220.2	209.9	258.1	242.6	294.8	283.6

FIGURE 8
PROPORTIONS OF STUDENTS IN CATHOLIC
AND PUBLIC SCHOOLS WHO HAVE COMPUTERS
AT HOME



Mathematics and Science Proficiency of 11th-Graders Related to Coursework in Computer, Mathematics, and Science

While all comparisons reported thus far in this report have been between students in Catholic and public schools, the 1985-86 NAEP assessments of mathematics and science do not report differences in coursework by sector. Instead, the comparisons (except for computer courses) are of Catholic school 11th-graders compared to the national average. As stated in earlier reports (Lee 1985-86), such comparisons probably slightly underestimate Catholic/public differences, as the Catholic school scores are included in the national average. The findings about coursework differences, nevertheless, are among the major findings of this report. To summarize, Catholic school students complete a substantially greater number of mathematics and science courses than does the national average of students.

Computer Coursework. Figure 9, which displays the proportions of students enrolled in computer courses, shows that students at all three grade levels who attended Catholic schools in 1985-86 were more likely to be in a computer course than the national average of students. Mathematics scores of all those who were taking computer courses (not shown) were significantly higher for Catholic school students; science scores of 3rd and 7th grade Catholic school students who were taking computer courses were significantly higher.

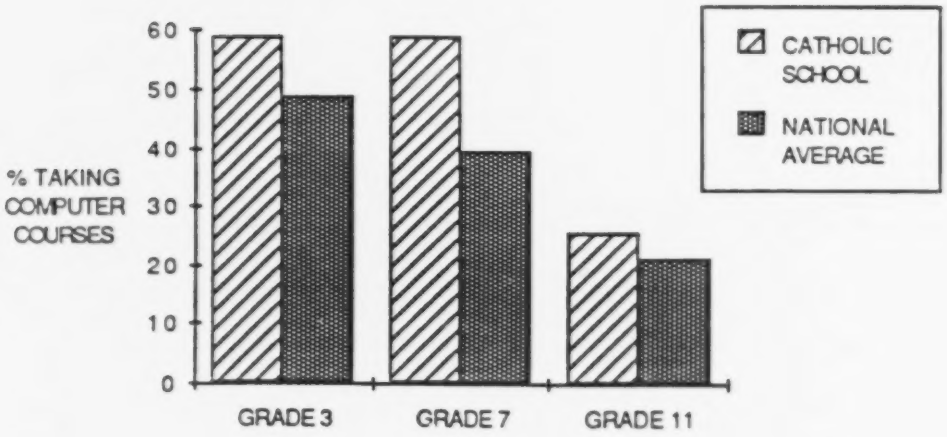
The proportion of Catholic school students in grade 11 who report taking computer courses in 1985-86 is considerably higher than the proportion of 1983-84 so reporting; this increase has not been matched by the national average[7] (See Figure 10). While 1983-84 Catholic school students were 6% less likely to take computer courses than those in the national average,

a 14% increase in computer course-taking as compared with only a 3% increase on the national average means that Catholic school students in 11th grade are 5% more likely to be taking computer courses in 1985-86 than students in the national average. Of course, such estimates (which are not made on the same students or schools) are subject to sampling error. Difference scores are particularly sensitive to such error.

Mathematics and Science Coursework.

A. General Comparisons. The proportions of students who have completed various mathematics courses by grade 11 in Catholic and national average schools and their related mathematics proficiencies provide some of the most interesting comparisons in this report. Not surprising, mathematics proficiency scores for those who have taken more advanced mathematics courses are significantly higher than for those who have not (Table 9). However, mathematics proficiency scores for students in Catholic schools who complete each mathematics course are not significantly different from scores of the same subgroups of national average students. What is most noteworthy about these comparisons are the proportions of students in Catholic and national average schools taking each course (Figure 11). That is, the proportions of Catholic school students who complete algebra I, geometry, and algebra II are significantly higher than proportions of students who complete these same courses in the national average. While 14% more Catholic school students complete algebra I than do students in the nation's average, these figures rise to 28% more students in Catholic schools who complete geometry; and 27% more who complete algebra II. Given the strong relationship between advanced course-taking and proficiency, these large proportional differences are the

FIGURE 9
PROPORTIONS OF STUDENTS IN CATHOLIC
AND NATIONAL AVERAGE SCHOOLS WHO
WERE TAKING COMPUTER COURSES
IN 1985-86



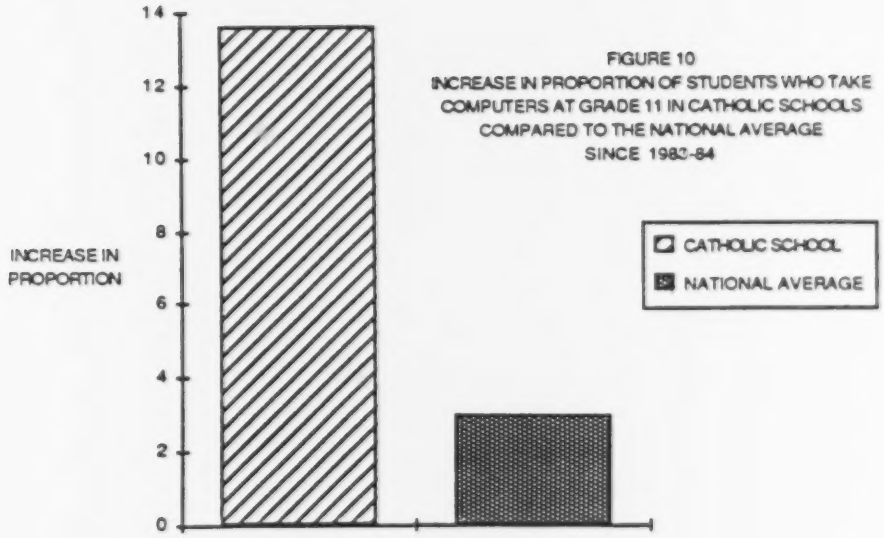


FIGURE 10
INCREASE IN PROPORTION OF STUDENTS WHO TAKE COMPUTERS AT GRADE 11 IN CATHOLIC SCHOOLS COMPARED TO THE NATIONAL AVERAGE SINCE 1983-84

Table 9

Proportions and Math Proficiency Scores for Students Who Complete Various Math Courses by Grade Eleven in Catholic and National Average Schools

	CATHOLIC SCHOOL		NATIONAL AVERAGE	
ALGEBRA I				
Yes	95.6%	316.0	81.6%	312.5
No		281.6		272.7
GEOMETRY				
Yes	90.5%	317.3	62.8%	319.6
No		288.6		281.7
ALGEBRA II				
Yes	76.1%	319.9	49.6%	323.1
No		297.8		287.8
TRIGONOMETRY				
Yes	25.6%	332.4	19.5%	335.7
No		308.2		298.0
PRE-CALCULUS OR CALCULUS				
Yes	6.1%	342.0	6.3%	341.7
No		312.4		302.6

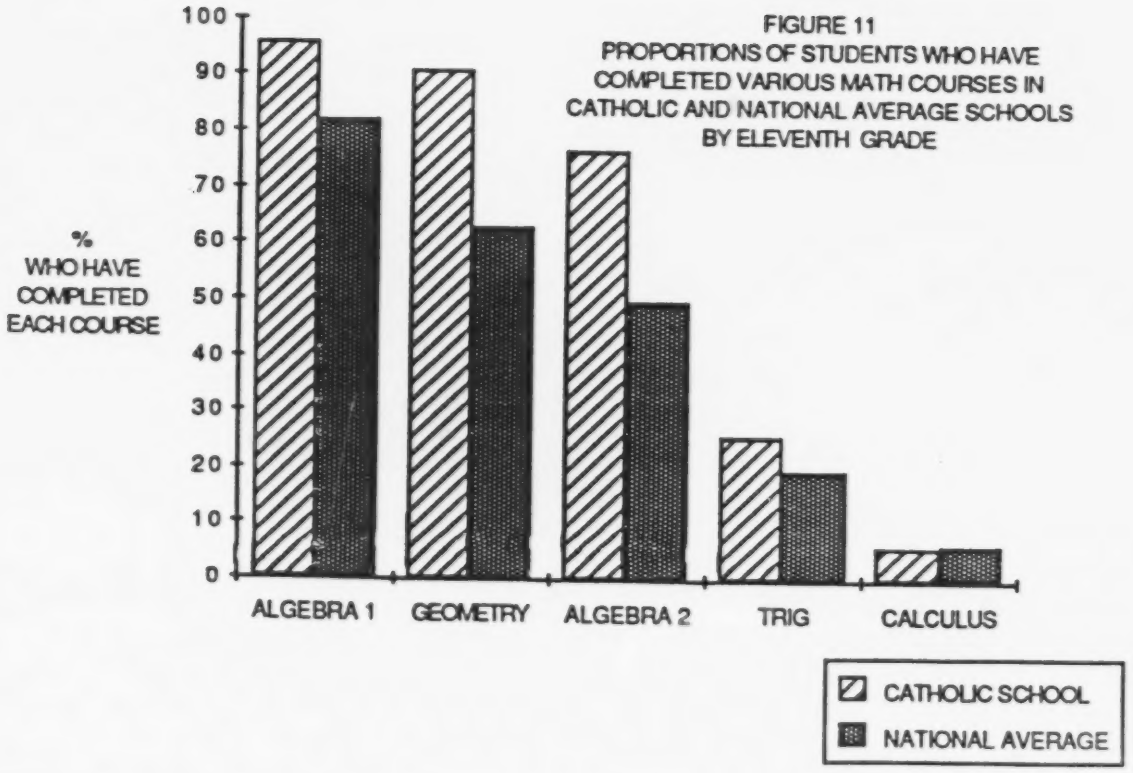


FIGURE 11
PROPORTIONS OF STUDENTS WHO HAVE COMPLETED VARIOUS MATH COURSES IN CATHOLIC AND NATIONAL AVERAGE SCHOOLS BY ELEVENTH GRADE

most likely explanation for the mathematics proficiency advantage of Catholic school students, in our opinion. Other research makes similar claims (Lee & Bryk, 1988; Hoffer et al., 1985).

Patterns in science coursework, shown in Table 10 and Figure 12, indicate that the relationships between coursework and science proficiency are similar to those in mathematics. The major differences worth noting here are in chemistry, where 26% more Catholic school students have completed this course by grade 11 than students in the national average. Very few students in either type of school (11%) report having taken physics by Grade 11, a course we assume is usually taken in Grade 12. Of those who do, Catholic school physics students score considerably higher in science proficiency than the national average.

B. Gender Differences. While the proportions of males and females who complete various levels of mathematics coursework at grade 11 are similar for Catholic and national average schools (numbers not shown), in both school types, males outnumber females as mathematics courses become more advanced. These results support those reported by Lee (1988), which were taken from transcripts of 1982 high school graduates as part of the High School and Beyond study. Similar proportions of males and females in national average schools complete general science, biology, and chemistry by grade 11, while in Catholic schools, females are as likely as males to complete general science and biology, but 14% less likely to complete chemistry at this point in high school. As we have already noted, very few students of either gender have taken physics by grade 11. While there are stronger gender differences in course-taking in chemistry and physics in

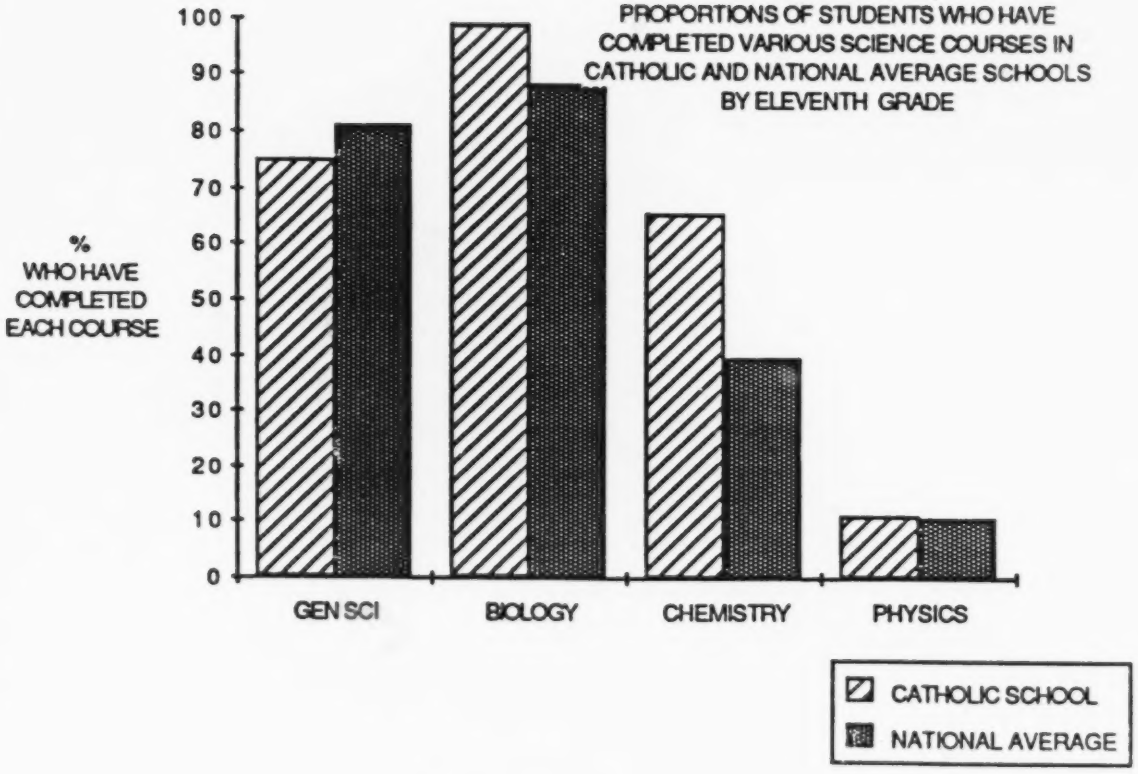
Table 10

Proportions and Science Proficiency Scores for Students Who Complete Various Science Courses by Grade Eleven in Catholic and National Average Schools[a]

	CATHOLIC SCHOOL		NATIONAL AVERAGE	
GENERAL SCIENCE				
Yes	74.9%	302.1	80.7%	292.7
No		300.1		292.2
BIOLOGY				
Yes	98.7%	302.3	88.8%	295.8
No		255.1		267.6
CHEMISTRY				
Yes	65.3%	313.6	41.8%	315.6
No		280.4		277.0
PHYSICS				
Yes	11.0%	334.6	11.0%	308.9
No		298.0		290.6

[a]Proportions related to science coursework are calculated from sample sizes given in the NAEP 1985-86 Science Proficiencies Assessment Almanac, Grade 11.

FIGURE 12
PROPORTIONS OF STUDENTS WHO HAVE COMPLETED VARIOUS SCIENCE COURSES IN CATHOLIC AND NATIONAL AVERAGE SCHOOLS BY ELEVENTH GRADE



Catholic than national average schools, the proportional enrollment in these courses, especially chemistry, is much higher in Catholic schools. For example, while almost 15% fewer females take chemistry than males in Catholic schools (72% vs. 58%), it is still true that 14% more females take chemistry in Catholic schools (58%) than males in national average schools (44%). That is, while there appears to be a sex difference favoring males in course-taking in the physical sciences in Catholic schools, girls in those schools are much more likely to have taken physical science by 11th grade than the national average for either gender.

Social Differences in Coursework in Mathematics and Science

A. Race/Ethnicity. Our investigation of equity concerns continues as we present the differences in coursework patterns for race/ethnic groupings in Table 11. These findings very strongly support the academic equity in Catholic schools. That is, while the gaps in academic course enrollment between White and either Black or Hispanic students in mathematics are practically nonexistent in Catholic schools, minority students are substantially less likely to take such courses in the national average schools.

Figures 13 and 14, created from Table 11 data, dramatically show the differences in proportions of each race/ethnic group who completes geometry and algebra II in Catholic and national average schools. About 50% more Blacks complete geometry and 47% more complete algebra II in Catholic schools than the national average, while 43% more Catholic school Hispanic students complete geometry and 32% more complete algebra II than national average Hispanic students. These differences persist through advanced

coursework, as well, as may be seen at the bottom of Table 11 for trigonometry and calculus. In Catholic schools, there are no racial/ethnic differences in the proportion of students taking these courses (i.e., almost everyone does), while in the national average of schools minority students are less likely to enroll in academic mathematics courses.

Racial/ethnic differences in science course-taking for Catholic and national average students is not so dramatic as in mathematics (see Table 12). An exception is chemistry, where the difference in the proportion of Blacks taking this course is especially noteworthy: 60% in Catholic schools vs. 32% in national average schools. The proportion of 11th-graders in Catholic and national average schools who have completed biology (Figure 15) and chemistry (Figure 16) show this pattern. While neither racial/ethnic differences nor sector differences are strong for the proportion of students reporting having taken biology, the strong sector differences in the proportion of students who have taken chemistry, and the lower proportions for minority students in the national average, are quite evident.

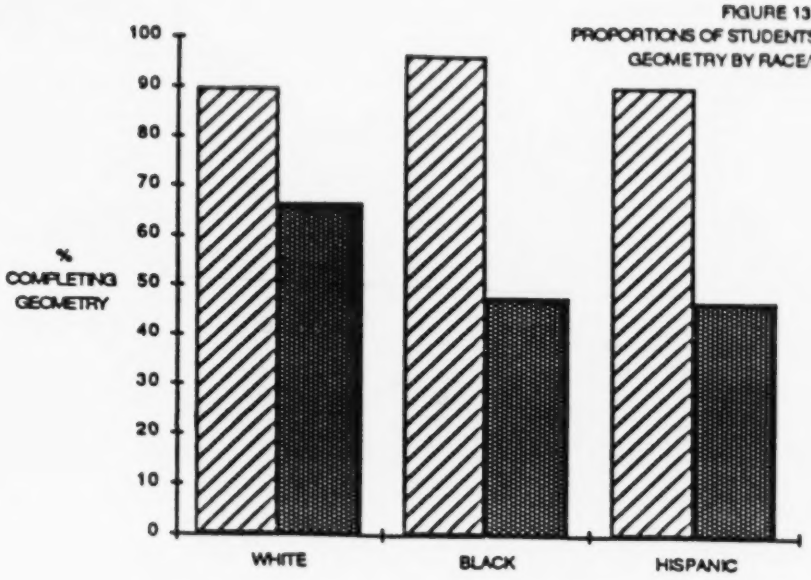
B. Parents' Education. The association between the proportion of students who take academic courses in mathematics and parental education (NAEP's proxy measure of socio-economic status) is shown in Table 13. At each level of parental education, a significantly greater proportion of Catholic school students completes algebra I, geometry, and algebra II at grade 11 than national average students. While there is a strong relationship between the proportion of students who complete each mathematics course and the level of parental education in national average schools (i.e., students whose parents have more education take more courses), this

Table 11

Proportions of White, Black, and Hispanic Students Who Complete Various Math Courses by Grade Eleven in Catholic and National Average Schools

CATHOLIC SCHOOL			NATIONAL AVERAGE		
WHITE	BLACK	HISPANIC	WHITE	BLACK	HISPANIC
		ALGEBRA I			
95.8%	93.4%	96.4%	83.7%	73.0%	71.9%
		GEOMETRY			
89.6%	96.2%	90.1%	66.4%	47.6%	47.0%
		ALGEBRA II			
75.2%	84.2%	66.2%	52.5%	37.2%	34.6%
		TRIGONOMETRY			
24.7%	31.5%	9.4%	20.4%	12.7%	10.7%
		PRE-CALCULUS OR CALCULUS			
6.3%	5.1%	4.1%	6.5%	2.6%	4.3%

FIGURE 13
PROPORTIONS OF STUDENTS WHO COMPLETE GEOMETRY BY RACE/ETHNICITY



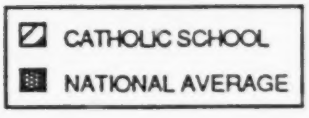


FIGURE 14
PROPORTIONS OF STUDENTS WHO COMPLETE ALGEBRA 2 BY RACE/ETHNICITY

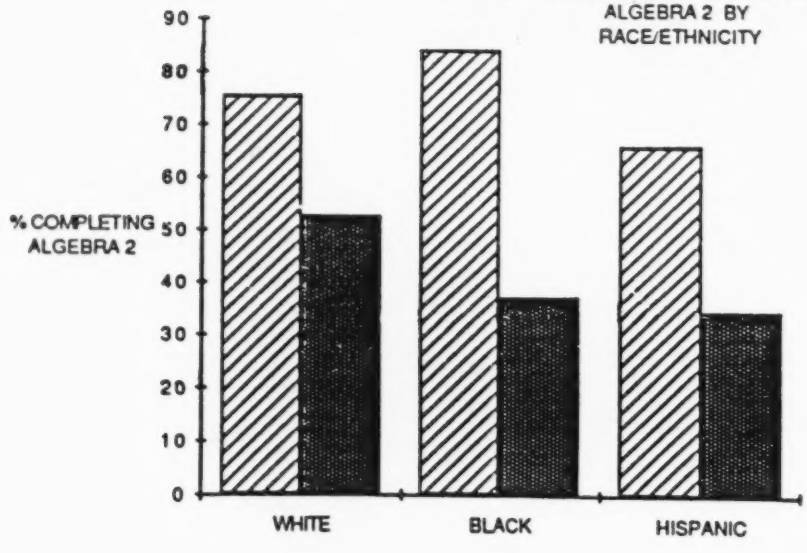


Table 12

Proportions of White, Black, and Hispanic Students Who Complete Various Science Courses by Grade Eleven in Catholic and National Average Schools[a]

CATHOLIC SCHOOL			NATIONAL AVERAGE		
WHITE	BLACK	HISPANIC	WHITE	BLACK	HISPANIC
		GENERAL SCIENCE			
73.3%	86.3%	79.8%	80.8%	79.4%	81.5%
		BIOLOGY			
99.2%	100.0%	86.5%	89.2%	89.1%	82.3%
		CHEMISTRY			
66.2%	59.6%	38.9%	43.7%	31.5%	29.1%
		PHYSICS			
10.2%	10.7%	8.1%	9.9%	12.6%	14.8%

[a]Proportions related to science coursework are calculated from sample sizes given in the NAEP 1985-86 Science Proficiencies Assessment Almanac, Grade 11.

FIGURE 15
PROPORTIONS OF STUDENTS WHO COMPLETE BIOLOGY BY RACE/ETHNICITY

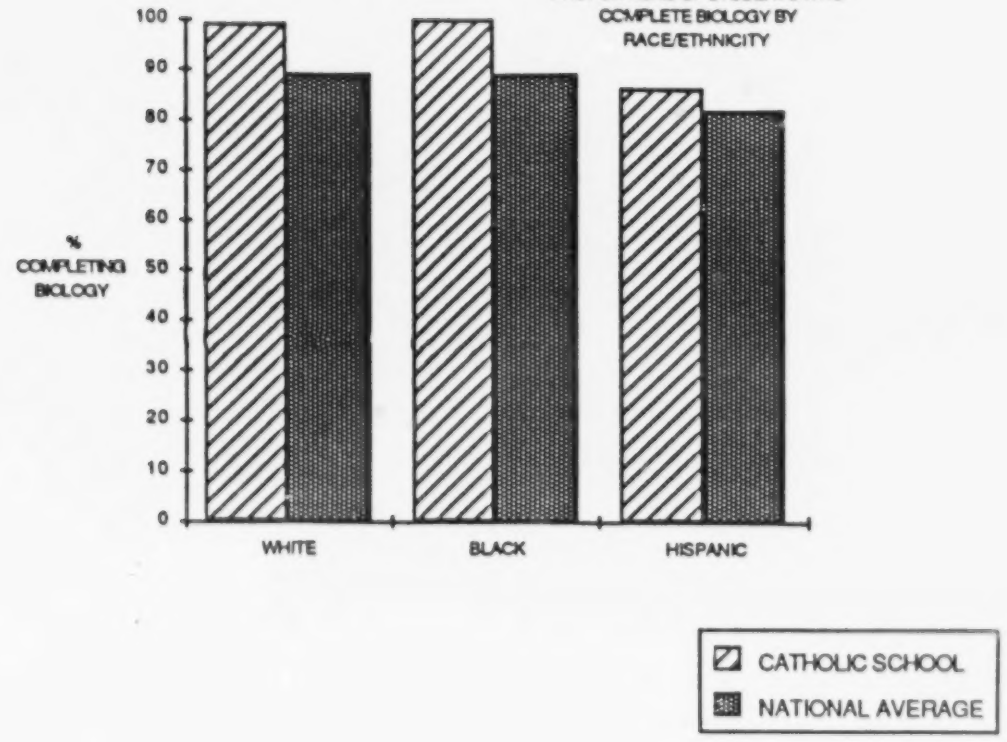


FIGURE 16
PROPORTIONS OF STUDENTS WHO COMPLETE CHEMISTRY BY RACE/ETHNICITY

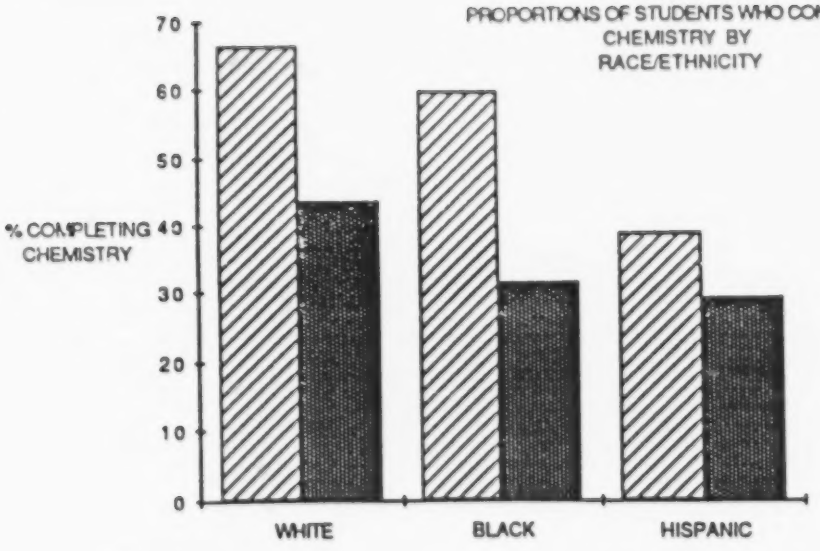


Table 13

Proportions of Students at Different Levels of Parental Education Who Complete Various Math Courses by Grade Eleven in Catholic and National Average Schools

CATHOLIC SCHOOL				NATIONAL AVERAGE			
<HS GRAD	HS GRAD	HS+	COL GRAD	<HS GRAD	HS GRAD	HS+	COL GRAD
ALGEBRA I							
95.5%	93.4%	95.9%	96.5%	63.3%	73.5%	84.5%	90.9%
GEOMETRY							
94.3%	84.2%	91.5%	92.5	37.8%	48.8%	64.7%	78.3%
ALGEBRA II							
74.7%	65.5%	78.0%	80.3%	28.8%	35.1%	50.1%	64.9%
TRIGONOMETRY							
16.3%	17.1%	23.6%	31.4%	8.3%	10.2%	18.0%	29.9%
PRE-CALCULUS OR CALCULUS							
0.0%	3.6%	6.6%	7.6%	3.1%	2.8%	4.6%	10.6%

relationship is quite weak (and often not statistically significant) in Catholic schools. These different trends for the two school types are especially dramatic for geometry (see Figure 17). While the association between parental education level and the proportion of students who complete geometry is strong, levels rise, whereas the proportions of Catholic school students taking this course is consistently high (about 90%) and virtually unrelated to parental education.

The same pattern of relationships, although less pronounced, is evident in science (see Table 14). As we saw before, however, enrollments in chemistry are more distinctive. For the national average of students, parental education is strongly related to the probability of taking chemistry (ranging from 21% for students whose parents have no high school diploma to 58% for those whose parents have college degrees -- Figure 18). However, for 11th-graders in Catholic high schools, the proportions are consistently higher and relatively unrelated to parental education (from 49% to 71% for the same parental education comparisons made above).

C. Summary of Equity Issues in Course-taking. It is our conclusion that the reported differences in the association between social background and course-taking in mathematics and science for Catholic and national average schools are among the most important in this report. While it is not surprising that, on average, students in Catholic high schools take more academic courses in mathematics and science and have higher proficiency in these areas at least partly as a result of this more academic orientation, it is always possible that such advantages in both course-taking and proficiency might be "explained" by the more socially advantaged students

who attend these schools. However, the biggest Catholic advantage over national average schools are found for less advantaged students, be they Black, Hispanic, or students whose parents did not attend college. This is primarily because students' family background and their in-school behaviors are almost unrelated in Catholic schools, while such associations are consistent and strong in the national average of students.

FIGURE 17
PROPORTIONS OF STUDENTS AT EACH LEVEL OF PARENTAL EDUCATION WHO COMPLETE GEOMETRY IN CATHOLIC AND NATIONAL AVERAGE SCHOOLS

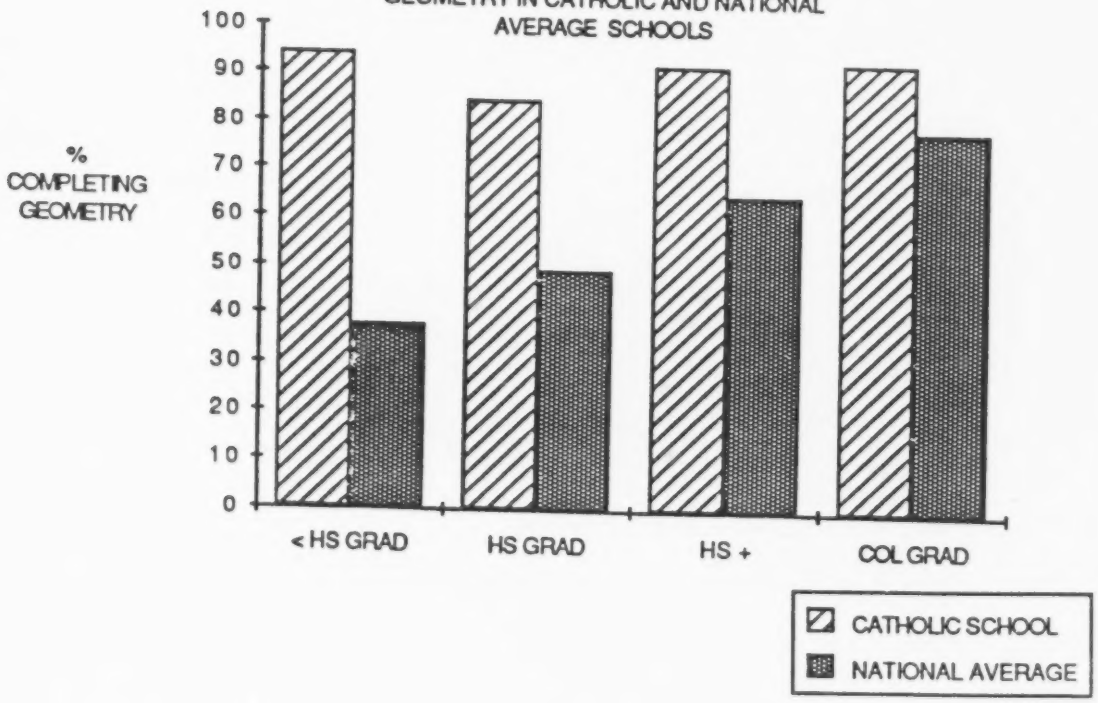


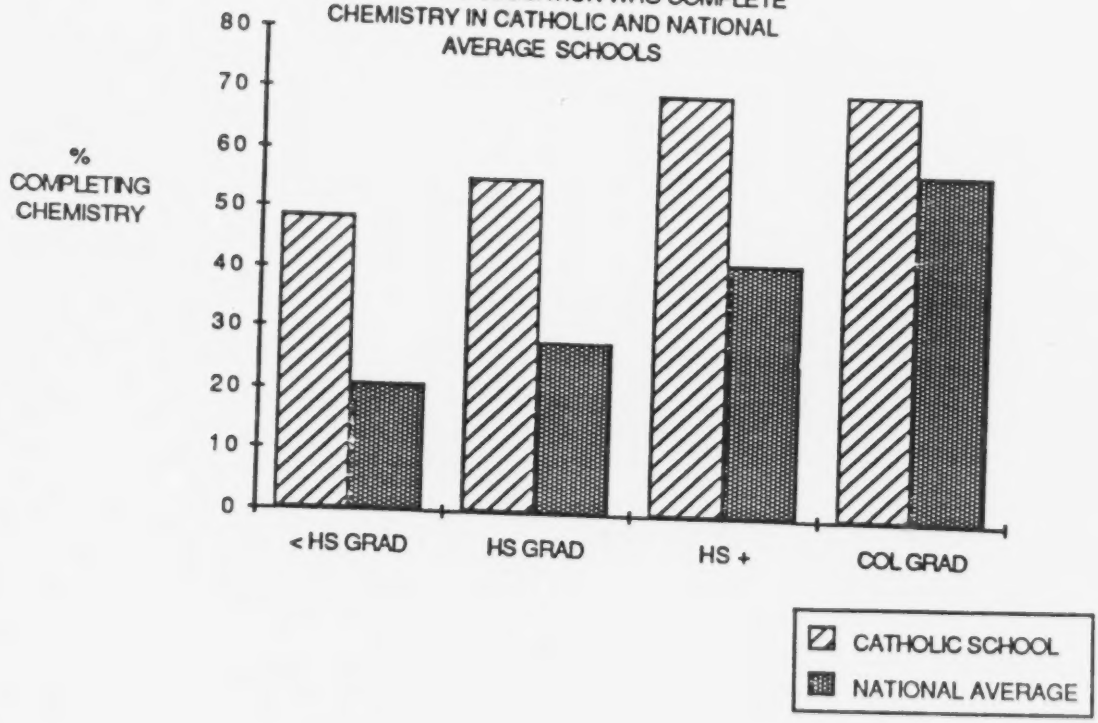
Table 14

Proportions of Students at Different Levels of Parental Education Who Complete Various Science Courses by Grade Eleven in Catholic and National Average Schools[a]

CATHOLIC SCHOOL				NATIONAL AVERAGE			
<HS GRAD	HS GRAD	HS+	COL GRAD	<HS GRAD	HS GRAD	HS+	COL GRAD
GENERAL SCIENCE							
75.1%	77.5%	76.2%	73.7%	81.9%	81.9%	80.7%	80.2%
BIOLOGY							
96.3%	98.6%	97.8%	99.6	81.0%	85.0%	91.0%	93.0%
CHEMISTRY							
48.7%	55.2%	69.6%	70.6%	20.8%	28.3%	41.8%	57.6%
PHYSICS							
8.8%	5.4%	12.6%	12.5%	11.2%	7.5%	8.9%	14.2%

[a]Proportions related to science coursework are calculated from sample sizes given in the NAEP 1985-86 Science Proficiencies Assessment Almanac, Grade 11.

FIGURE 18
PROPORTIONS OF STUDENTS AT EACH LEVEL OF PARENTAL EDUCATION WHO COMPLETE CHEMISTRY IN CATHOLIC AND NATIONAL AVERAGE SCHOOLS



GENERAL CONCLUSIONS

The authors of the 1985-86 mathematics and science Report Cards conclude that, on average, students in the nation's schools are below acceptable levels in mathematics and science achievement (Dossey et al., 1988; Mullis & Jenkins, 1988). However, NAEP results show that Catholic school mathematics and science proficiency levels at grades 3, 7, and 11 are significantly above those of public school students, indicating that these schools might be educating their students better. While it is not possible to completely disentangle the possible causes for such higher proficiency between superior educational treatment within the schools and the more advantaged students who attend, the within-sector comparisons on the socially equitable distribution of proficiency strongly favor Catholic schools.

The results presented here have confirmed two common findings in educational research. First, and unfortunate, for the national average of students, family background is consistently and positively related to performance in mathematics and science. Second, but more positive, the mathematics and science proficiency of high school students is positively related to their coursework in both areas. The difference between students in Catholic and public (or national average) schools which relates to the association between family background and (1) course-taking, and (2) academic proficiency has comprised the focus of this report. Let us briefly summarize these findings.

Minority Group Differences. The fact that the proficiency differences between minority and White students is considerably smaller in Catholic than public schools demonstrates a thrust toward social equity in those schools not

typical in most schools in America. We find this very, very important. Moreover, Catholic schools are serving many students in urban areas in this country, areas where the public schools have been identified as particularly problematic. Even though both Black and Hispanic proficiency scores fall behind White students in mathematics and science proficiency in both public and Catholic schools, there is much less discrepancy among scores of racial/ethnic groups in Catholic school mathematics and science scores. The proficiency scores for both mathematics and science have been computed on a single scale for each curricular area (see Appendix for identification of proficiency levels). We note a particularly poignant example of these racial differences in public schools, where the average science scores of 7th grade Black and Hispanic students (described as "understanding simple scientific principles") are below that of 3rd grade White students, and the average science proficiency of Black 11th-graders is below that of White 7th-graders (i.e., the ability to "apply basic scientific information"). Such grade-level "crossovers" are not found among Catholic school students' scores.

Minority students in Catholic high schools are almost as likely as White students to enroll in academic courses in math and science. We know that taking these courses (a) is an important requirement of college admission; and (b) produce higher achievement in these areas. Therefore, we believe that the more consistent and socially equitable push of Catholic schools toward academic pursuits for their students -- all of their students -- is a major factor in the higher performance of Catholic school students on NAEP tests.

Differences Related to Parents' Education. While relationships between parents' education and academic performance are (unfortunately) not independent of relationships between racial background groups and academic performance, we have been forced to examine these two factors separately. Minority students are frequently from families whose parents are less well educated, yet our analyses have not been able to untangle these two highly confounded factors. However, we have also found that Catholic schools promote social equity in regard to parents' education and educational outcomes. As with racial/ethnic differences, we have found that proficiency differences across levels of parents' education are much less diverse in Catholic schools.

Even more striking was the almost total lack of association in Catholic high schools between the number of academic courses taken in mathematics and science and students' parents' educational levels. However, this association was strong and consistent in courses in both curricular areas for the national average of students. Since course-taking is the major predictor of achievement (see Bryk et al., 1984; Lee & Bryk, 1988-89), we believe that social equity in the academic treatment of students within schools produces social equity of educational outcomes. This is a major difference in Catholic schools -- all students, regardless of curricular track, race, ethnicity, or social status, follow an academic program.

Gender Equity. Cross-sector comparisons of the differences between male and female students' mathematics and science proficiency do not show the same pattern of a more equitable distribution of outcomes for Catholic schools as for other demographic characteristics examined in this report.

In fact, there is a generally slightly greater male proficiency advantage, which increases with grade level, in the Catholic school sector when compared with public school scores. This male advantage is especially strong for high school science proficiency in Catholic schools. However, even though the science proficiency of females in Catholic high schools is below their male counterparts, it is higher than that of males in public schools. Moreover, gender differences in proficiency are not as large as differences due to race/ethnicity or to parental education. It should be noted that we may attribute these female score deficiencies in part to differences in course-taking, especially at advanced levels. In both Catholic and national average schools, there are gender differences in advanced course-taking in math and science favoring males reported in NAEP.

What may we conclude? In our definition of "good schooling," both academic excellence (i.e., high average achievement) and a socially equitable distribution of achievement are important. Social equity in achievement is meaningless, however, unless accompanied by high-average achievement. Equalizing achievement in schools where everyone does poorly is hardly equitable. This point has been made by Lee and Bryk (1988), where they examined characteristics of the normative environment and academic organization of high schools -- Catholic and public -- which appeared to account for the differences in both excellence and equity which favor Catholic high schools. In the present report, we have been unable to explore either why Catholic high schools appear to provide both superior and equitable outcomes for their students, or even to definitively establish

whether such advantages are due to the internal operation of the schools or to the more selective student body in such high schools.

There is a considerable body of research which has examined the questions explored in this research, and most of it has come to the same conclusion -- that Catholic high schools appear to deliver particular benefits to less advantaged students, compared to public schools. Why, therefore, have we explored such questions here? What are the findings of this report which distinguish it from earlier research on the same topic? We believe there are several:

- National assessment results are available for students in elementary, middle, and high schools, whereas most of the earlier research has concentrated on high school students. It was found here that the advantages of Catholic high schools documented elsewhere are generalizable to elementary and middle school levels. However, the strongest advantages are still at the high school level.

- While earlier NAEP results on writing, and particular reading (1983-84) reported many findings quite similar to those reported here, it was useful to see whether the findings for those curricular areas were generalizable to mathematics and science. They were.

- Earlier research (Bryk et al., 1984; Hoffer et al., 1985) found that Catholic schools were weaker in science relative to other curricular areas. While the findings here in terms of higher proficiency levels and equity are valid in both mathematics and science, the particular advantages

found in this report for Catholic schools are stronger in mathematics than in science.

Our conclusion from this report supports the results of other research we have done. That is, by our dual definition of "good" schooling -- excellence and equity -- Catholic schools are good schools. Sara Lawrence Lightfoot has explored the question of what constitutes a "good" school in some detail, and her definition is in substantial agreement with ours. She concludes that, "A final way of judging institutional goodness for students is to observe the regard and treatment of the weakest members." (1983, p. 349). Catholic schools fit this bill quite nicely. A more important question is why public schools fall so far from this mark. We believe they have a lot to learn from the Catholic school example.

Technical Notes

1. These proportions have been calculated from the National Assessment of Educational Progress: 1985-86 Assessment Almanac, Mathematics Proficiencies, grades 3, 7, and 11, which give sample sizes, rather than percentages.

2. These figures are lower than those reported in 1983-84 at the 4th (6.8%) and 8th (10.9%) grade levels. At grade 11, the situation is reversed, where the proportion of Black Catholic school students has increased 3.7% since 1983-84. These differences are likely to result from sampling error, due to small subgroup sizes in the Catholic school sample.

3. The Catholic school Hispanic population has been reduced since 1983-84 in grade 11 from 8% to 5.2%. The 7th grade proportion of 12.5% is slightly higher than the 1983-84 8th grade figure of 9.5%. 1985-86 Hispanic 3rd-graders represent 9.6% of the Catholic school population, while in 1983-84, the proportion of Hispanics in grade 4 was 13.9%. The 1985-86 proportion of Hispanic students in grade 11 is lower than the 1983-84 figure of 8.0%. At grade 3 there are fewer Hispanic students than at grade 4 in 1983-84, and more 1985-86 7th grade Hispanics than 1983-84 8th grade Hispanics.

4. Fewer students in 1985-86 from both types of schools and at all levels have parents who have not graduated from high school than students in grades 4, 8, and 11 in 1983-84. The 1985-86 proportion of high school dropout parents of students in Catholic school grades 3 and 7 is slightly lower than that of 1983-84 Catholic school 4th and 8th grade parents.

5. NAEP divides what we have labeled "residential location" into seven groups according to size and type of community. We eliminated "extreme rural" and "low-metro" (or disadvantaged urban) from discussions of residential locations in this report since these locations only represent approximately 2% of the Catholic school population. These figures are quite different from the 1983-84 reading and writing reports (Lee, 1985; Lee, 1986).

6. Statistical significance is achieved when the difference between two means is more than twice as large as the square root of their combined squared standard errors (a standard T-test at the .05 probability level or below).

7. Figures for this comparison are taken from the 1983-84 National Assessment of Educational Progress Reading Proficiency: Catholic School Results and National Averages, Final Report (Lee, 1985, p. 18).

Appendix

MATHEMATICS: NAEP scores for all three grade levels are combined into a single scale from 0 to 500. For this report, the mathematics scale has been divided into five levels of proficiency (see Dossey, et al., 1988, Mathematics Report Card, p. 31):

Level 150--Simple Arithmetic Facts
Learners know some basic addition and subtraction facts.

Level 200--Beginning Skills and Understanding
Learners have considerable understanding of two-digit numbers, know some basic multiplication and division facts, recognize relations among coins, can read information from charts and graphs, and use simple measurement instruments.

Level 250--Basic Operations and Beginning Problem-Solving
Learners have an initial understanding of the four basic operations, are able to apply whole number addition and subtraction skills to one-step word problems and money situations, and can also compare information from graphs and charts.

Level 300--Moderately Complex Procedures and Reasoning
Learners are developing an understanding of number systems, they can compute with decimals, simple fractions, and commonly encountered percents. They can identify geometric figures, measure lengths and angles, and calculate areas of rectangles. These students are also able to interpret simple inequalities, evaluate formulas, and solve simple linear equations. They can find averages, make decisions on information drawn from graphs, and use logical reasoning to solve problems. They are developing the skills to operate with signed numbers, exponents, and square roots.

Level 350--Multi-step Problem-Solving and Algebra
Learners can apply a range of reasoning skills to solve multi-step problems, can solve routine problems involving fractions and percents, recognize properties of basic geometric figures, and work with exponents and square roots. They can solve a variety of two-step problems using variables, identify equivalent algebraic expressions, and solve linear equations and inequalities. They are developing an understanding of functions and coordinate systems.

SCIENCE: NAEP uses the following range of student performance in the assessment to describe five levels of science proficiency, based on a scale of 0 to 500 (see Mullis et al., 1988, Science Report Card, p. 38):

Level 150--Knows Everyday Science Facts
Students know some general scientific facts of the type that could be learned from everyday experiences: simple graphs, animal characteristics, operation of familiar apparatus.

Level 200--Understands Simple Scientific Principles
Students are developing some understanding of simple scientific principles, particularly in the Life Sciences.

Level 250--Applies Basic Scientific Information
Students can interpret data from simple tables and make inferences, and exhibit knowledge and understanding of the Life Sciences and Physical Sciences.

Level 300--Analyzes Scientific Procedures and Data
Students can evaluate the appropriateness of the design of an experiment, have more detailed scientific knowledge, and the skill to apply their knowledge in interpreting information from text and graphs.

Level 350--Integrates Specialized Scientific Information
Students can infer relationships and draw conclusions using detailed scientific knowledge from the Physical Sciences, particularly chemistry, and can apply basic principles of genetics.

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